Power Management Controls Project

November 2, 2000 PAC Meeting — Meeting Summary

This document summarizes[1] the discussion and conclusions from the recent Professional Advisory Committee (PAC) meeting for the Power Management Controls project. The results are being used to update the other documents presented (Institutional Review, Project Scope and Research Topics, and Project Plan) and in guiding the remainder of the project. The meeting was held at Berkeley Lab and conducted by Bruce Nordman. The presentation slides from the meeting are available on the project web site. The agenda noted the following goals:

To accomplish at the November 2 PAC meeting

- Present the project findings, goals, and objectives and discuss these sufficiently to assure that there is clarity and consensus on these. This will create a critical mass of support within the office equipment industry for the project.
- Gather comments on and approve the Institutional Review, Research Plan, and Research Topics.
- Identify additional resources for the next project phase such as key individuals in academia or companies, corporate resources such as testing laboratories, or key publications

Role of Professional Advisory Committee (PAC)

Bruce Nordman reviewed the role of the PAC, to emphasize that the industry representatives should feel confident that their views on which project directions are likely to be viable are treated with the utmost importance, since it is voluntary implementation of project results by the industry that will be the ultimate sign of project success. The plan is to have periodic PAC meetings by phone until such time as it becomes apparent that another in-person meeting is needed. In addition to providing feedback on project plans and results, PAC members are expected to assist in data collection on their own products, in selling the project within their company, and in outreach to industry organizations.

Background

Craig Hershberg of the EPA reviewed the major phases in the development of the ENERGY STAR program, noting that an emphasis on enabling and user interfaces was a logical step at this point in time. While this project is not an EPA project, the ENERGY STAR program will do what it can to help the project succeed, and assure that it and the project are compatible. This project and the ENERGY STAR program are not intended to address the same topic areas, though a PAC member pointed out that the current ENERGY STAR Printer/Fax MOU has some requirements for user interface design (in requiring that delay time and on/off controls for power management be in different menus).

Initial PAC Comments

The PAC members have a diverse set of job functions and cover the full range of office equipment products. Only two members are from companies with substantial sales of consumer electronics. Many PAC members work closely with the ENERGY STAR program, such as in negotiating the Memoranda of Understanding, and ensuring the largest possible penetration of ENERGY STAR compliance within their own products. Most members have principal responsibility for one product type, but can tap into expertise from people who work on other products.

[1] Some detailed points mentioned during the meeting are helpful but not included in this summary. Some comments have been moved from the agenda item within which they were raised to improve readability. The term "we" is used for all people at the meeting: PAC members, LBNL staff, and CEC staff.

Joseph Wang and Ray Tuvell from the California Energy Commission (the project sponsor) emphasized that the non-mandatory nature of this project is critical to them; several PAC members concurred with this.

Design

For many companies, the choice of the international 'standby' symbol is due tothe use of a soft switch, rather than a hard switch that reduces unit power to zero. This raises potential legal or regulatory implications in the symbol choice. In copiers, functions such as anti-condensation heaters can raise the off state power consumption much more than just a soft switch requires.

Several members commented that the use of terms and symbols on their own products are often inconsistent. There is a need to educate product designers about the importance of consumer controls. Additionally, warm-up time is a particular concern, particularly for imaging equipment (which may take several minutes to come out of a sleep state), but even also for monitors. As PCs increasingly move off of desktops and to locations out of easy view, the value of an indicator only on the front of the PC may diminish.

Several members commented that some of their products are co-designed with other companies, with both influencing the ultimate design. In many companies, product design is dispersed geographically and organizationally, contributing to diversity in power management user interface elements, though for some, there are efforts to standardize some design aspects, to increase usability, which this project is consistent with.

The ongoing patent dispute over Display Power Management Signaling (DPMS) could lead to a change in how the communication between the computer and monitor is done, with possible implications for the user interface. The evolution to digital interfaces between the computer and monitor may also be important for this.

Behavior

Some monitors use amber for the normal low-power state and a slowly flashing amber for the lowest state; other monitors use alternating green/amber for one low-power state and solid amber for a lower state[2]. Fast flashing indicator lights are used on some monitors for error conditions, such as data coming to the monitor faster than it can be displayed. It is unclear how the green/amber convention for monitors became so widespread, though early on it gained the critical mass of use to maintain it on even in the absence of any specific standard requiring it. That green/amber LEDs are relatively cheaper than some other color combinations (or two separate indicators) helped their use become standardized.

Particularly for printers and copiers, there is the question of whether sleep modes should supercede error modes or vice versa. Presently, for at least some printers, the error mode trumps power management, with an internal 'state machine' defined that determines the system state.

Other

Several anecdotes were related about why many people erroneously believe that power management should be routinely disabled. Consumer education in this area is critical. As more devices become networked (particularly in homes), we can expect a rising number of devices to be kept on and more awake than before, which could significant increase their energy use. The speed and direction of home network proliferation remains murky. The convergence of office and consumer devices also poses challenges for the project.

Several members reported that the project is perceived positively and with interest within their organization, though concern was raised that its results could eventually be incorporated into ENERGY STAR requirements (there is no plan to do this).

[2] The 'amber' color is sometimes referred to as yellow or orange; this difference doesn't seem to be important, but convergence to a single color term may be helpful for user documentation.

PC power management is highly dependent on Intel and Microsoft so that there are only certain areas in which individual manufacturers can make design changes. The PC platform power management capability has advanced considerably with the advent of ACPI, but is still a work in progress. Care needs to be taken that this project doesn t constrain the detailed implementations, (but with the project scope as it is, this shouldn t be a problem).

Project Scope

The project scope (from the "Project Scope and Research Topics" document) is defined by four criteria: user interface elements, location of elements, types of devices, and operating metaphors.

For the list of user interface elements, Bruce proposed adding "Switches/Buttons" and "Device Behavior" to the four initial elements. Device Behavior encompasses descriptions of different options for power management within a device, or behaviors such as combinations of indicators, transitions, etc. Device Behavior was originally envisioned as part of the "Operating Metaphors" element, but Bruce proposed that that instead be focused on the overall concepts that people bring to their understanding of power management (e.g. that devices are 'asleep'). Ease of Use was raised as a possible element, but it was agreed that it is at the core of the entire project and not readily separable. We reconfirmed that the terms of interest are those that a casual user sees, and not those that only service technicians or 'expert' users may encounter. The list of the original four and additional two elements was approved.

The second part of the scope is the location of user interface elements. It was clarified that documentation could occur in traditional manuals, in software, or be available on the Internet. Some companies have style guides for how to present information in manuals; the portions of these that address power management may be useful to assess. The proposed list was approved.

The third scope section is the types of devices to address, specifically the balance between traditional office equipment and 'everything else' (consumer electronics, appliances, and other information or entertainment devices, with these categories not mutually exclusive). Limiting the project to office equipment would be problematic as there is increasing convergence between the two broad categories; defining a bright line between them becomes less possible, and less worthwhile. Additionally, the opportunity to define power management details for the other device types (for which they are mostly not yet defined) is one that should not be missed. On the other hand, the full range of devices could be too large to properly address within project resources.

The PAC agreed to the initial plan of an intensive focus on office equipment and a less comprehensive effort on other devices, but with the proviso that this issue should continue to be revisited in later PAC meetings. The PAC also agreed to the suggestion that Bruce should maintain specific lists of device types to include and exclude from our analysis. A member observed that the project might be informed by the development of such elements in device types even if our recommendations do not cover them (mobile phones was a specific example cited) so there may be a third category of devices—'review but not recommend'. For energy savings, products that are (at least part of the time) powered from the grid rather than batteries are of primary interest, though battery-only devices may be of the 'review but not recommend' type. These lists could be annotated with comments as to why or why not a particular product type is of interest.

The PAC further agreed to limit our core analysis to devices currently for sale in the U.S. This puts aside devices that are no longer sold—even though they may be present in homes and offices—and products sold only in other countries. Exceptions to this can be made, but this general guidance should help keep the scope tractable. Data collection can also include devices in development to the extent that relevant information about them is or can be made public. Success in the U.S. should cause others to do the necessary work to fully internationalize project results.

The scope of what the project does not cover was reviewed and approved.

There was a brief discussion of Intellectual Property (IP) issues. Bruce believes that any recommendations that result from the project will be sufficiently obvious or established as to be immune to IP claims. Some PAC members were less confident of this, though all agreed that colliding with IP was not desirable and not imminent, but that ongoing attention to the issue was needed. If a particular topic does raise sufficient IP concern, that could be a reason to drop it so as not to jeopardize the rest of the project.

"Who is Involved in Power Management Controls" (the Institutional Review)

The PAC addressed each part of the Institutional Review to identify any errors or omissions in it. For relevant labels, the GEA (Europe), Toprunner (Japan), and TCO (Sweden) programs should be included. The Ease of Use Roundtable recently decided to drop power management as an area of active work in deference to this project this will allow the roundtable to focus scarce resources elsewhere. The ENERGY STAR program includes international franchises in more countries than the draft notes, including Japan, New Zealand, and Taiwan. The European Printer Manufacturers Institute may have an interest in the topic.

Ken Salaets of the Information Technology Industry Council (ITI) said that ITI represents the leading providers of information technology products and services. The non-profit association is a strong advocate of government-industry partnerships and voluntary agreements, such as ENERGY STAR. ITI firmly resists efforts to impose redundant labeling requirements and burdensome regulations that tend to distort markets and increase compliance costs, while producing minimal net benefits to the environment. As a leading voice for industry, ITI strives to identify and promote practical approaches to achieving greater energy efficiency in information technology products and components. To facilitate that effort, ITI is launching the Global Energy Efficiency Consortium, an organization dedicated to increasing communication and cooperation within industry, as well as with governments, consumers and other stakeholders in the U.S. and abroad.

Several PAC members mentioned that there are U.S. federal government efforts to promote the accessibility of products (including IT devices) to the disabled. These are coordinated by The Access Board , a federal agency, and the IT recommendation (one was issued in May, 1999) may address colors and system behavior. Indicator colors are of more concern in Europe than in the U.S. With the proviso that these comments will be incorporated, the Institutional Review was approved.

Research Topics

The discussion of each of the two dozen research topics listed was lively and detailed. The PAC agreed to take a first pass at refining the list by assessing each topic on two grounds: **Priority** the importance of the topic to ultimate project success; and **Effort** the amount of project resources the topic deserves. A topic could be important but require only modest effort. The initial ranking is shown in Table 1 below, sorted by priority rather than the order in the topics document.

It was thought that the two topics Composite devices and Diversity of Low-power modes could be combined, as could the three topics Changing Power States , Transition Indicators , and Quick State transitions . For Batteries, the primary interest was to learn from what interface elements have been successful; the expectation is that the interface for batteries is sufficiently clear and consistent already that our project does not need to make recommendations about them, so that the research effort can be modest.

For each of the topics listed, Bruce will provide further discussion of the relevance of the topic, and try to identify ways to limit the data collection for it to keep the topic tractable.

Table 1. Topic Assessment

Topic	**Priority**	**Effort**		*Topic*	**Priority**	**Effort**
Controlled/Controlling Devices	1	L		Disability	2	M
Remote Indicators	1	L		Culture	2	S
Composite devices	1	L		Temporary Changes	2	S
Diversity of Low-power Modes	1	L		Terminology	2	S
Power Management Schemes	1	L		Miscellaneous	2	S
Changing Power States	1	L		State after Power Failure	2	S
Transition Indicators	1	L				
Quick State Transitions	3	S		Language	3	S
Linked Behavior	1	L		TV-like Remotes	3	S
Archetype of PM	1	L		Batteries	3	S
Behavior on Wake Event Type	1	M		Role of Term ENERGY STAR	3	S
Interactions with non-PM Modes	1	S		Self-monitoring	3	S
				Imaging Byproducts	drop	drop

Notes: For Priority, 1 is high and 3 is low. For Effort, the rankings are Small, Medium, and Large.

Research Plan

The discussion of the Research Plan was less focused and conclusive than that for the Research Topics. The PAC ultimately concluded that the plan could be better revised after the topics discussion was fleshed out and organized. There is much to be done for the next two tasks: Continue Outreach/Marketing and Assess Devices and Interfaces between now and the next PAC meeting (a teleconference). Berkeley Lab will concentrate on those two tasks while the plans for the later phases are refined.

PAC members identified a key need to help explain the project to others a diagram of the proposed project phases and schedule. There may be other diagrams that could be developed to better show some aspects of the project.

It is important to keep our data collection efforts focused, not only to keep the project within the resources that are available, but to also assure that information requests to manufacturers are both critical and not burdensome. Bruce will gather initial data before making information requests to provide examples and to hone the request.

One request to manufacturers will be for results of usability testing that can be shared. The project would benefit from the maximum amount of such tests to be publicly available, but it is apparent that competitive interests may limit this. In some cases, test conclusions may be helpful even if the detailed reports cannot be shared. Apart from design testing, there may be data from call centers or other sources that can indicate successful or unsuccessful designs.

Consumer preference was raised by several members; the challenge is how the project might be able to shed light on this. It may be that most design decisions about power management are made by people who lack access to such data; closing this gap should be an outcome of this project.

Ease of Use was brought up repeatedly as a key current concern in the industry. Many companies have done studies of usability issues, some of which may address power management. Clearly this project could benefit from these and their conclusions.

Marketing/Outreach

PAC members suggested a variety of ways to reach out to people who should know about the project. These include:

- The IEEE International Symposium on Electronics and Environment (IEEE-ISEE). The next annual meeting of ISEE is May 7—9 in Denver. The deadline for abstracts was October 27.
- ITI channels. ITI can distribute information about the project to member companies.
- The 'printer discussion group'. This email list grew out of the most recent update to the ENERGY STAR Printer/Fax MOU.
- The European Printer Manufacturers Institute. The EPMI may provide a good conduit to Europe-based manufacturers.
- The Video Electronics Standards Association. VESA has a newsletter reaches a large number of computer and monitor manufacturers.
- Magazines. These following magazines were suggested as possibly being interested enough in the project to run an article on it. *Engineering Design*, *Human Factors*, *Human Interface*, *EE Times*, and *Business and Environment*.
- The Electronics Industries Association (EIA) newsletter.
- The ENERGY STAR News page/email.

Leading manufacturers of consumer electronics not involved in office equipment (e.g. cell phones) should also be contacted. One problem that became apparent is that there is no single magazine or other media outlet, and no conference or trade show that both adequately covers the entire industry and is particularly appropriate for this project. Thus, our effort will be necessarily diverse. We tried to identify events at which a majority of PAC members would already be at, which could serve as convenient places/times to have an in-person PAC meeting. However, there seemed to be no such event, so the next meeting is likely to be at Berkeley Lab. Most project communications will be done via email.

Next Steps / Next Meeting

The next PAC meeting will be a telephone conference; Bruce has tentatively set these for February, July, and October of 2001. Feedback from the PAC could change this schedule, and will also determine when the next in-person PAC meeting is needed.